

THE NEW WORLD ALYDINE GENUS *STACHYOCNEMUS* STÅL (HEMIPTERA: ALYDIDAE)

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Abstract.—*Stachyocnemus* is redescribed, and its relationships discussed; except perhaps for *Tollius*, *Stachyocnemus* appears to have no close relatives in North America, Mexico, or Cuba which encompass the known range of the genus. A specimen from Cuba represents a new country record, and specimens from Connecticut are a new state record. Of the two taxa proposed in the genus, *S. cinereus* Fracker is synonymized with *S. apicalis* (Dallas), which is redescribed.

Key Words: Alydidae, Heteroptera, *Stachyocnemus*, genital capsule, Nearctic Region, Cuba

Stachyocnemus is a genus of small distinctive alydines. Although not uncommon, members of the genus live on the ground (in dry areas) and are not often collected. The genus is Nearctic and extends into southern Mexico; it also occurs in Cuba (this paper). There have been two species in the genus, *Stachyocnemus apicalis* (Dallas) and *S. cinereus* Fracker. Differences between these two are neither great nor consistent. Here we redescribe the genus, synonymize *S. cinereus* with *S. apicalis*, and redescribe the species.

METHODS AND MATERIALS

In addition to the holotype of *Stachyocnemus apicalis* and the type series of *Stachyocnemus cinereus* (holotype ♂, Ft. Collins, CO; allotype ♀, La Salle, CO; paratype ♂, Gunnison, CO), we have examined more than 80 specimens from the full range of the genus. Specimens were examined in more detail from New Mexico (Socorro Co.), Texas (Brazos Co.), Connecticut (Barkhamsted, Litchfield Co. [new state

record]), Oaxaca, Mexico, and Havana, Cuba [new country record]. These more closely studied specimens are in the collection of CWS or the University of Connecticut Insect Collection (the Cuban specimen is from The Natural History Museum, London). The type material of *S. cinereus* was borrowed from the National Museum of Natural History, Smithsonian Institution (Washington, D.C.), and the type of *S. apicalis* is from The Natural History Museum (London).

Genus *Stachyocnemus* Stål

Stachyocnemus Stål, 1870, p. 215 (orig. description).

Stachyocnemus Stål, 1873, p. 91 (key).

Stachyocnemus; Lethierry and Severin, 1894, p. 113 (cat.).

Stachyocnemis (sic!); Van Duzee, 1906, pp. 386–387 (note).

Stachyocnemis (sic!); Banks, 1910, p. 75 (cat.).

Stachyocnemus; Van Duzee, 1917, p. 115 (cat.).

- Stachyocnemus*; Fracker, 1918, p. 275 (description).
- Stachyocnemus*; Malloch, 1921, p. 54 (trichobothria).
- Stachyocnemus*; Torre-Bueno, 1925, p. 28 (ecology and habits).
- Stachyocnemus*; Blatchley, 1926, pp. 268–269 (description).
- Stachyocnemus*; Torre-Bueno, 1940, p. 159 (note).
- Stachyocnemus*; Schaefer, 1972a, p. 139 (loss of scent gland apparatus).
- Stachyocnemus*; Schaefer, 1972b, p. 817 (loss of scent-gland apparatus, and ecology and biology).
- Stachyocnemus*; Slater, 1974, pp. 162–163 (relationships).
- Stachyocnemus*; Schaefer, 1980, pp. 116–118 (male genital capsule).

Head: Dorsum ranging from almost flat to convex, declivent; about as wide as long; paraclypei free of and projecting beyond clypeus, pointed; setae on dorsum of head dark, scattered, conspicuous; interocellar distance approximately equal to distance between ocellus and eye. Antenna short, about half as long as body, with conspicuous dark scattered setae; first antennal segment surpassing apex of head but shorter in total length than head; relative length of segments in ascending order either 2, 3, 4, 1 or 3, 2, 4, 1. Rostrum reaching mesosternum; fourth segment only slightly longer than third; relative lengths of segments in ascending order either 3, 4, 1, 2 or 3, 4, 2, 1. *Thorax*: Pronotum wider than long; anterior one-third not arising above level of collar; posterior corners distinctly acuminate but not drawn out into spines; with small tooth in middle of posterior margin; usually a darker triangle evident medially on pronotum with apex directed anteriorly; setae dark, scattered, conspicuous; pleural areas of meso- and metathorax minutely granulate. Scent gland orifice small, inconspicuous, peritreme absent. Scutellum longer than wide; apex more or less truncate; apex and edges slightly raised. Corium

punctate; apical portion not extending along costal edge of membrane as in other alydines. Hind coxae widely separated; hind femur weakly incrassate, armed on posterior surface with two rows of spines; hind tibia straight, without apical spine, but armed with two parallel rows of spines, one row larger and more prominent; tibial setae present, longer than spines; first hind tarsal segment almost twice as long as combined length of second and third segments. *Abdomen*: Robust; sternum IV longer than other sterna. *Male genital capsule and paramere*: Fig. 1.

Type species: *Alydus apicalis* Dallas.

Stachyocnemus is easily distinguished from other North American and Mexican alydines by this combination of characters: small size (about three-quarters the size of the others); lack of an apical hind-tibial spine, of a costal stridulitrum, and of a metathoracic scent gland peritreme; hind tibia with two rows of spines; and fourth antennal segment shorter than first. Among the Alydinae, only *Stachyocnemus*, *Euthetus* Dallas, and *Tollius* Stål lack the scent gland peritreme; *Euthetus* is Old World tropical, and the New World *Tollius* lacks the two rows of spines on the hind tibia.

The generic relationships of *Stachyocnemus* are unclear. Slater (1974) suggested the genus was “more closely related to Palearctic than to Neotropical genera” (p. 162). Torre Bueno (1940) separated *Stachyocnemus* and *Tollius* as a group of North American alydines distinct from *Alydus* Fabricius, *Megalotomus* Fieber, and *Hyalymenus* Amyot et Serville. *Stachyocnemus* and *Tollius* do somewhat resemble each other in habitus, both being smaller than members of the second group, and both having obsolescent metathoracic scent gland apparatuses. However, *Tollius* has, and *Stachyocnemus* lacks, the stridulitrum-plectrum complex and the genital capsule’s surcapsular spines, apomorphies possessed also by *Alydus* and *Megalotomus* but not *Hyalymenus* (Schaefer et al. 1989). And *Hyalymenus* and *Stachyocnemus* both have

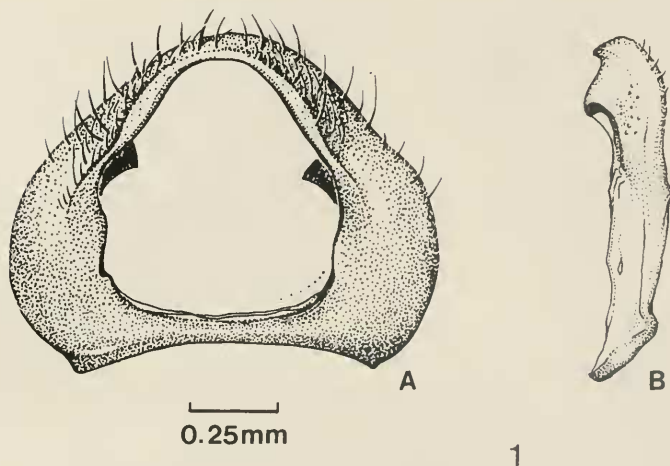


Fig. 1. *Stachyocnemus apicalis*; Texas. Genital capsule (A) and paramere (B) of male. (Note: capsules and parameres of New Mexico and Connecticut specimens, and of the holotype of *S. cinereus*, are identical to those figured here.)

a supporting spur extending from the genital capsule's infolded ventral rim to the cuplike sclerite (Schaefer 1980).

In a cladistic analysis of alydid genera, Li and Zheng (1993) place *Riptortus* + *Camptopus* as the sister clade of *Stachyocnemus*. Their text states that the three genera share three apomorphies. However, their matrix indicates that *Riptortus* Stål lacks one of these apomorphies and that *Camptopus* Amyot et Serville lacks another. Thus *Stachyocnemus* shares one apomorphy with both (vesica of aedeagus spiralled), one with *Riptortus* (apex of paramere hooked), and one apomorphy with *Camptopus* (a conjunctival character). Yet *Stachyocnemus* shares all these apomorphies with *Mirperus*, considered by Li and Zheng (1993) the sister clade of *Stachyocnemus* + (*Riptortus* + *Camptopus*). Also, *Stachyocnemus* shares two exclusive apomorphies with *Tollius* (absence of metathoracic scent gland peritreme, metasternum broad).

Riptortus occurs in the Old World tropics; a few species reach into the southern temperate regions of Asia. *Camptopus* appears to have a rather restricted range in eastern and southern Europe; and *Mirperus* Stål is Afrotropical. The range of none of

these genera supports a sister-group relationship with *Stachyocnemus*, which ranges through the Nearctic south of Canada and into Mexico and Cuba. *Tollius* is closer to *Stachyocnemus* than are other alydid genera, but the evidence is equivocal and the relationship weak. We agree with Fracker (1918) and Schaffner (1964), that *Stachyocnemus* has no close relatives among the North American or Mexican alydines or among any others.

Schaffner (1964) noted that the *Stachyocnemus* male's genital capsule is "unique" and that it is "suggestive of" that of the Coreinae (p. 96); later (1979, letter to CWS) he wrote that "the margin of the genital capsule . . . is higher and consequently more like that of the Coreinae." In addition, Schaefer (1980) showed that the capsules of both groups have a fused cuplike sclerite and median projection, and an entire (not excised) ventral rim. Of these three features, the last is certainly plesiomorphic, the second (although advanced) occurs widely elsewhere, and the first is both plesiomorphic and common. These similarities do not indicate a relationship of *Stachyocnemus* and the Coreinae.

The known range of the genus is from

Connecticut (this paper) south into Florida and west into Alberta (Froeschner 1988), through Mexico as far south and east as Oaxaca (Brailovsky and Flores 1979), and also into Cuba (this paper).

These insects feed upon seeds of a low-lying legume (M. H. Sweet, personal communication), and are not predaceous, as Vestal (1913) suggested.

In 1918 Fracker described a new "variety" of *Stachyocnemus apicalis* (Dallas), hitherto the only species in the genus. He characterized *S. apicalis* var. *cinereus* as paler than the nominate form, more western, and differing in several structural features. Influenced by Fracker's descriptions and figures, Torre Bueno (1940) raised var. *cinereus* to species rank; later (1941) he gave the range of each as overlapping in the Rocky Mountain states.

After examining 78 specimens of both forms, Schaffner (1964) concluded "There is a great range of variability among specimens of the same series" and "Characters given by Fracker (1918) and Torre-Bueno (1950[sic]) for separation of varietal or specific designations are of no value"; and he synonymized *S. cinereus* Fracker with *S. apicalis* (Dallas). This conclusion, and the synonymy, were never published.

Fracker (1918) distinguished *S. apicalis* from the variety *cinereus* on the basis of four characteristics:

- Jugal projecting, or not, from tylus. The clypeus (tylus) and paraclypei (juga) are the same in all specimens we have examined, including the holotype of the *S. apicalis* (Florida), a male from Cuba, the type series of *S. cinereus* (Colorado), and specimens from nearby New Mexico. In the New Mexican specimens, however, a heavy white pubescence (which is darker and less dense in all other specimens) obscures the clypeus and paraclypei and thus their relationship (not so in the *S. cinereus* type series or the Cuban specimen).
- Body color of *S. cinereus* gray-flaves-

cent, with fine gray pubescence; *S. apicalis* black with ferruginous markings and little or no gray pubescence. The former is true (see above) of the New Mexico specimens; the others are reddish brown (Texas, Oaxaca) or dark brown (Connecticut). Oddly, the *S. cinereus* type series itself is pale brown to tan, and the holotype of *S. apicalis* is brown to dark brown.

- Head depressed (*S. apicalis*) or not (*S. cinereus*). The head is equally depressed in all specimens.
- Medial tooth on pronotum's posterior border smaller in *S. apicalis* than in *S. cinereus*; this is true of both holotypes. This tooth in the Connecticut specimens and the one from Cuba is smaller than in the others. But the Oaxaca specimens, where the tooth is larger, otherwise agree with Fracker's description of *S. apicalis*, not of *S. cinereus*; and the tooth of the New Mexico specimens is smaller than that of the *S. cinereus* type series. This character cuts across Fracker's descriptions of the two species.

In addition, the pre-antennal head of the members of the *S. cinereus* type series, and of the *S. apicalis* holotype, is broader—the paraclypei narrow less sharply—than is the head of the Connecticut and New Mexico specimens. But specimens from other parts of the United States, including Texas, and from Oaxaca and Cuba, are intermediate.

The New Mexico and Texas specimens are smaller than the others, as are the male holotype and paratype of *S. cinereus* and the male holotype of *S. apicalis*. But the width-length ratios (width across humeri and total body length) are not greatly different: New Mexico, 0.273; Connecticut, 0.310; Oaxaca, 0.300; Texas, 0.290; *S. cinereus* holotype, 0.298; allotype, 0.269; paratype, 0.300; *S. apicalis* holotype, 0.293; Cuba 0.301. Similarly, the width-length ratios of the genital capsules from the Texas (0.800), Connecticut (0.820), and New Mexico (0.833) specimens differ but little.

The width-length ratio of the *S. cinereus* holotype, however, is 1.0, but in structure it is identical with that of a Texas specimen (Fig. 1). The overall size differences therefore appear to have resulted from changes in absolute, not in relative, growth and are therefore unlikely to be genetic.

The only character which appears to separate the two forms is the paler body color and whitish pubescence of *S. cinereus*. This is insufficient to warrant distinguishing the two as species, especially as the genital capsule and parameres of all specimens are identical (Fig. 1).

Moreover, the distributions do more than overlap; *Stachyocnemus cinereus* is an island in a sea of *S. apicalis*. Fracker (1918) lists the former from Colorado (type locality), Indiana, Montana, and Arizona; and we have specimens that fit this description from New Mexico. *S. apicalis* is found throughout North America (Froeschner 1988) and Brailovsky and Flores (1979) list it through Mexico to Oaxaca; these latter authors' description of their specimens fits *S. apicalis* better than it does *S. cinereus*.

For all these reasons, we agree with Schaffner's unpublished dissertation (1964), and synonymize *Stachyocnemus cinereus* Fracker with *S. apicalis* (Dallas).

Stachyocnemus apicalis (Dallas)

Alydus apicalis Dallas, 1852, p. 479 (orig. description).

Stachyocnemus apicalis; Stål, 1870, p. 215 (cat.).

Alydus apicalis; Walker, 1871, p. 159 (cat.).

Alydus apicalis; Walker, 1873, p. 42 (cat.).

Stachyocnemus apicalis; Uhler, 1886, p. 12 (list).

Stachyocnemis apicalis; Lethierry and Severin, 1894, p. 112 (cat.).

Stachyocnemus apicalis; Heidemann, 1902a, p. 32 (distribution).

Stachyocnemus apicalis; Heidemann, 1902b p. 81 (distribution).

Stachyocnemus apicalis; Van Duzee, 1909, p. 160 (note).

Stachyocnemis (sic!) *apicalis*; Banks, 1910, p. 75 (cat.).

Stachyocnemus apicalis; Fracker, 1918, pp. 275–276, pl. 11, figs. 13, 14 (description, adult fig.).

Stachyocnemus apicalis; var. *apicalis*; Fracker, 1918, p. 276, pl. 11, fig. 13 (note, adult fig.).

Stachyocnemus apicalis; var. *cinereus* Fracker, 1918, p. 276, pl. 11, fig. 14 (orig. description, adult fig.) (**new synonymy**).

Stachyocnemus (sic!) *apicalis*; Johnson and Ledig, 1918, p. 4 (list).

Stachyocnemus apicalis; Malloch, 1921, p. 81, fig. 16 (trichobothria, fig.).

Stachyocnemus apicalis; Blatchley, 1926, pp. 269–270 (description, note).

Stachyocnemus apicalis var. *cinereus*; Blatchley, 1926, p. 270 (note).

Stachyocnemus apicalis; Leonard, 1928, p. 88 (list).

Stachyocnemus apicalis; Torre-Bueno, 1940, p. 159 (note).

Stachyocnemus cinereus; Torre-Bueno, 1940, p. 159 (new status).

Stachyocnemus apicalis; Torre-Bueno, 1941 p. 88 (distribution).

Stachyocnemus cinereus; Torre-Bueno, 1942, p. 180 (distribution).

Stachyocnemus apicalis; Sherman, 1948, p. 16 (distribution).

Stachyocnemis (sic!) *apicalis*; Strickland, 1953, p. 196 (distribution).

Stachyocnemus apicalis; Froeschner, 1988, p. 8 (cat., distribution).

Stachyocnemus cinereus; Froeschner, 1988, p. 8 (cat., distribution).

Type data: Holotype, male, "St. John's Bluff, East Florida." United States. On deposit in The Natural History Museum, London.

Description: Pale to dark brown, paler specimens more heavily beset with pale recumbent setae. Entire insect except for fourth antennal segment and tarsal segments usually with conspicuous, decumbent, flat almost scale-like microtrichia, these sometimes silvery under high illumi-

nation. Side of head with pale line running from gula onto lateral edge of pronotum. Pronotum with large triangular region medially, this lightly setose and therefore appearing darker than lateral regions, these more heavily beset with pale setae; collar yellow. Corium sometimes speckled or lightly mottled with darker brown; if with pale recumbent hairs, these more dense along veins. Membrane pale to dark brown, with dark brown speckling; veins at very base dark brown, rest of membrane pale brown. Legs heavily mottled with brown; spines of femora and tibiae dark brown. Abdominal venter pale to dark brown, often paler medially, heavily speckled with brown or reddish spots; with erect brown setae interspersed among white recumbent setae, venter not heavily hirsute; each segment laterally with large pale spot surrounding spiracle, and with another sublateral spot anterior to trichobothria (latter spots sometimes obscure or poorly defined). Total length: 7–9 mm.

NEW DISTRIBUTIONAL RECORDS

CUBA: Grillo Ravelo (1989) listed the aldydine genera *Burtinus*, *Hyalymenus*, and *Megalotomus* from Cuba. A male in The Natural History Museum (London) of *Stachyocnemus apicalis* adds a fourth genus to the list. Labels: Havana III. 4.v.12/AWJ Pomeroy collector/U.S. America A.W.J. Pomeroy. 1919-269/Pres. By Imp. Bur. Ent. [last label pinned face down].

U.S.A., Connecticut: Although *Stachyocnemus apicalis* has been recorded from as close as New York and New Jersey (Froeschner 1988), it has not been listed from Connecticut; we list here two males from Barkhamsted, in the northwestern part of the state, collected in different summer months. Labels: CT: Litchfield Co., Barkhamsted, Farmington River across from Rt 181, June 11, 1991/R. J. Packauskas collector [in collection of C.W.S.]. Second specimen: Barkhamsted nr. Rt. 318, Litchfield Co., CT Aug. 1,

1991, R. J. Packauskas [in Univ. Conn. Insect Collection].

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LITERATURE CITED

- Banks, N. 1910. Catalogue of the Nearctic Hemiptera-Heteroptera. Philadelphia, American Entomological Society.
- Blatchley, W. S. 1926. Heteroptera, or true bugs, of eastern North America. Indianapolis, The Nature Publishing Company.
- Brailovsky, H. and R. Z. Flores. 1979. Contribucion al estudio de los Hemiptera-Heteroptera de México: XVII. Revision de la familia Alydidae Amyot y Serville. Anales del Instituto de Biologia Universidad Nacional Autónoma México, Series Zoologia 30: 255–339.
- Dallas, W. S. 1852. List of the Specimens of Hemipterous Insects in the Collection of the British Museum. Part II. London, British Museum.
- Fracker, S. B. 1918. The Alydinae of the United States. Annals of the Entomological Society of America 11: 255–282.
- Froeschner, R. C. 1988. Family Alydidae Amyot and Serville, 1843. The broad-headed bugs, pp. 4–11. In Henry, T. J. and R. C. Froeschner, eds., Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. Leiden, E. J. Brill.
- Grillo Ravelo, H. 1989. *Burtinus notatipennis* Stal (Heteroptera: Alydidae) en Cuba. Comunicaciones Breves (Revista Centro Agrícola) 16(1): 90–92.
- Heidemann, O. 1902a. [exhibition note] Proceedings of the Entomological Society of Washington 5: 32.
- . 1902b. Hemiptera, pp. 80–83. In Caudell, A. N., Some insects from the summit of Pike's Peak,

- found on snow. *Proceedings of the Entomological Society of Washington* 5: 74–83.
- Johnson, C. and R. Ledig. 1918. Tentative list of Hemiptera from the Claremont-Laguna region. *Journal of Entomology and Zoology* 10: 308.
- Leonard, M. D. 1928. A list of the insects of New York with a list of the spiders and certain other allied groups. New York (Cornell) Agricultural Experiment Station Memoir 101.
- Lethierry, L. and G. Severin. 1894. *Catalogue general des Hémiptères*. Vol. 2. Bruxelles, F. Hayes.
- Li Xin-zheng and Zheng Le-yi. 1993. Preliminary study on the phylogeny of Alydidae (Hemiptera: Coreoidea). *Acta Zootaxon. Sinica* 18: 330–343. [In Chinese, with English abstract.]
- Malloch, J. R. 1921. Systematic notes on Hemiptera Heteroptera. *Bulletin of the Brooklyn Entomological Society* 16: 54–56.
- Schaefer, C. W. 1972a. Clades and grades in the Alydidae. *Journal of the Kansas Entomological Society* 45: 135–141.
- . 1972b. Degree of metathoracic scent-gland development in the trichophorous Heteroptera (Hemiptera). *Annals of the Entomological Society of America* 65: 810–821.
- . 1980. The genital capsule of the Alydidae (Hemiptera: Heteroptera: Coreoidea). *International Journal of Insect Morphology and Embryology* 9: 107–128.
- Schaefer, C. W., J. C. Schaffner, and I. Ahmad. 1989. The *Alydus*-group, with notes on the alydine genital capsule (Hemiptera: Heteroptera: Alydidae). *Annals of the Entomological Society of America* 82: 500–507.
- Schaffner, J. C. 1964. A taxonomic revision of certain genera of the tribe Alydini (Heteroptera: Coreidae). PhD dissertation, Iowa State University, Ames.
- Sherman, F. 1948. Coreidae of South Carolina in comparison with North Carolina (Hemiptera). *Entomological News* 59: 15–17.
- Slater, J. A. 1974. A preliminary analysis of the derivation of the Heteroptera fauna of the northeastern United States with special reference to the fauna of Connecticut. 25th Anniversary Memoirs of the Connecticut Entomological Society, pp. 145–213.
- Stål, C. 1870. *Enumeratio hemipterorum*. Part 1. *Kongliga Svenska Vetenskaps-Akademiens Handlingar* 9: 1–232.
- . 1873. *Enumeratio Hemipterorum*. Part 3. *Kongliga Svenska Vetenskaps-Akademiens Handlingar* 11: 1–163.
- Strickland, E. M. 1953. An annotated list of the Hemiptera (s.l.) of Alberta. *The Canadian Entomologist* 85: 193–214.
- Torre-Bueno, J. R. de la. 1925. Methods of collecting, mounting and preserving Hemiptera. *Canadian Entomologist* 57: 6–10, 27–32, 54–57.
- Torre-Bueno, J. R. de la. 1940. *Tollius vanduzeei* n. sp., with notes on the genera *Tollius* Stal and *Stachyocnemus* Stal (Heteroptera, Alydidae). *Bulletin of the Brooklyn Entomological Society* 35: 159–161.
- . 1941. A synopsis of the Hemiptera-Heteroptera of American north of Mexico. *Entomologica Americana* 21: 41–122.
- . 1942. Notes on Coreidae. *Bulletin of the Brooklyn Entomological Society* 37: 180.
- Uhler, P. R. 1886. Checklist of the Hemiptera Heteroptera of North America. Brooklyn, Brooklyn Entomological Society.
- Van Duzee, E. P. 1906. New North American Heteroptera. *Entomological News* 17: 384–391.
- . 1909. Observations on some Hemiptera taken in Florida in the spring of 1908. *Bulletin of the Buffalo Society of Natural Sciences* 9: 149–230.
- . 1917. *Catalogue of the Hemiptera of America north of Mexico, excepting the Aphididae, Coccidae and Aleurodidae*. University of California Publications on Entomology 2, 902 pp.
- Vestal, A. G. 1913. An associational study of Illinois sand prairie. *Bulletin of the Illinois State Laboratory of Natural History* 10: 1–96.
- Walker, F. 1871. *Catalogue of the Specimens of Hemiptera Heteroptera in the Collection of the British Museum*. London, E. Newman.
- . 1873. *Catalogue of Hemiptera Heteroptera in the British Museum*. Supplement London, E. W. Janson.